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DEPARTMENT

OF

Lands, Mines and Fisheries

MINING OPERATIONS

IN THE

PROVINCE OF QUEBEC

DURING THE YEAR

1902

In connection with the Departmental report for the fiscal year 1901-1902.

BY

J. OBALSKI, M. E.,
Inspector of Mines.

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Inspector of Mines.

Sir,

I have the honor to lay before you, as I do every year, a detailed report on the progress of mining industry in the province during 1902.

The Mining Act continues to work in a regular and satisfactory way and the operations of the Bureau of Mines at Quebec, as well as of the Assay Office at Montreal, seem to give satisfaction to those interested in that industry.

The development of our mines goes on systematically, and, in the case of certain specialties, such as asbestos, copper, chrome, mica and the manufacture of pig iron, constitutes permanent industries, while others, such as graphite, the manufacture of cement and compressed peat, the utilization of our magnetic sands, &c., are yearly making marked progress proportionately to industry in general and the wants of the country, which, in course of time, will also create equally important industries.

Indications of copper have been found in the county of Matane, and prospecting is being prosecuted in that region.

According to the reports of the mining companies, there have been only two men killed and four seriously injured out of a total of 5000 hands employed in the industry. The instructions relative to the safety of the workmen and the protection of the women and children are well observed and good order is maintained by our sergeant of police. Five hotel licenses were granted under the Mining Act.

The total output of mineral products represents this year $3,000,000, gross value at the mine or at the mills.

I have the honor to be, Sir,

Your obedient servant,

J. OBALSKI, M. E.,
Inspector of Mines.

Quebec, February, 1903.

IRON.

No discovery of iron ore was made in the province during the year. Some rather important prospecting work, however, was done at the magnetic iron mine of Leeds, in the county of Megantic, under the direction of Mr. Charles Lionais, in following up and exposing the veins noted in last year's report.

In the township of Cleveland, XIII, 21, near Richmond, a little work was done on a deposit of hematite in the limestone and 60 tons of this ore were shipped to Drummondville.

On the North Shore of the St. Lawrence, the work of exploring the deposits of magnetic sand was continued and some notable transactions took place, including the sale by the Government of some extensive tracts of land on the east side of the river Natashquan, that are supposed to contain these ores. Concentration tests were also made on the deposits west of the Moisie river.

A very interesting paper on the agglomeration and electric treatment of magnetic iron ores in the pulverized or powdery state was submitted to the meeting of the Electro-Chemical Society by Mr. Marcus Ruthenburg, of Philadelphia. This paper was read at the meeting of the Society, held at Niagara Falls, in September last, and as the process is entirely applicable to the utilization of our magnetic sands, I give an analysis of it, together with a few notes on these important deposits.

Once purified, the magnetic sand presents the condition of a very fine sand that can be passed through a sieve of 80 meshes and contains about 70% of metallic iron and very little or no sulphur, phosphorus and titanium.

The Ruthenburg process consists in treating this sand in an electric furnace in which the melting zone is comprised within a magnetic field formed by magnets which are cooled by an internal stream of water and which act as electrodes. The elevation of the temperature formed by the arc melts the ore, which, when smelted, loses its magnetic property ; the grains agglomerate and the mass falls in pieces from the size of a bean to that of a nut, into a crucible. The ore is distributed in a regular way and the production of the melted ore is thus constant.

The product thus obtained possesses the same composition as the ore itself, except that the water and sulphur that it may have contained have disappeared and its consistency is that of a hard, porous ore, which puts it in the best condition for treatment.

Mr. Ruthenburg goes further, however, claiming that, if the ore be mixed with the dust of coke or wood charcoal which at the same time helps to maintain the arc, the oxyde of iron is partially reduced, without however entirely consuming the coal and the mass thus formed of agglomerated iron ore, reduced iron and unburnt coal, falls into the crucible. If it be left there for a certain time, owing to the heat retained in this mass, a regular cementing takes places, while a small quantity of slag also forms due to the ashes of the fuel and to the impurities remaining in the ore. This mass, which is then composed of spongy iron and carburetted iron, may be treated, in the reverberatory furnace for the production of steel without first passing through the blast furnace.

Mr. Ruthenburg gives no figures in his paper nor does he cite the results of experiment, but he states that he has employed this process for upwards of a year and he recommends it as practical and economical. He observes also that it can be applied, after enrichment, to magnetic ores that have been rendered poor by mixture with the rock ; he says that in the conditions under which he operated the consumption amounted to 450 kilo-wat hours per ton of the agglomerated product thus obtained and he estimates the cost of the kilo-wat hour at ¼ of a cent if produced by steam, and at 1/7 of a cent by water power, which corresponds to $1.12 1/2 per ton of fritted ore, in the first case, and to 67 1/2 cents in the second.

As a special application to the magnetic sands, I would recall that millions of tons of these exist on certain beaches along the North Shore of the Gulf of St Lawrence. The magnetic oxyde is therein found mixed with quartzose and feldpathic sand and titanic iron and occurs in a proportion ranging from 10 to 80% of magnetic oxyde, but which, practically and industrially, may be estimated at an average of 20%. Different processes have been invented for purifying it, and it is easily freed from the ordinary sand and titanium. A product is thus obtained yielding from 69 to 71 per cent of metallic iron, with traces to 0.04 of sulphur, traces to 0.04 of phosphorus, and 0.3 to 0.9 of titanium, besides 3 to 4 of quartz and silicates.

The objections to the working of these ores have been so far the following :

1. The abundance of titanium in the raw sand ;

2. The pulverulent state of the ore.

The first of these objections has been overcome by the use of special machines, either simply magnetic or electro-magnetic, which purify the ore in the dry state ; progress, however, should extend to the naturally wet sand. I would suggest that a first concentration should be effected on the spot with tables of great capacity ; a product would thus be obtained composed solely of magnetic oxyde and titanic iron that would be dried ; the titanic iron being then got rid of by means of a magnetic concentrator. A remedy for the pulverulent state has been sought by forming the sand into briquettes, but thus far without any great success. Should the Ruthenburg process prove practical, this second objection will also be removed, and we will then have at our disposal an important source of exceedingly remarkable iron ore. In point of fact, the working of these sands presents difficulties of quite another order, which, however, may be easily overcome by engineering science and capital. These deposits are situated on beaches facing the sea and at certain distances from good harbors. True, the hope is also entertained that other deposits will be found at short distances inland. The question therefore involves the handling of large masses by mechanical means, such as steam dredges or shovels, their transportation to the shipping points at distances of 5 to 15 miles and the providing of wharves, stores and elevators for their expeditious loading, as shipment in bags cannot be contemplated. Then there must be spacious steamers in sufficient number to remove them, inasmuch as the maximum length of the season of navigation on the St Lawrence is eight months. Taking all these facts into account, it will be seen that an undertaking of this kind cannot be conducted, except on a vast scale, necessitating large investments of capital. As far as a market is concerned, I estimate that ores of this quality, in the state of agglomeration mentioned, would be highly appreciated by the metallurgical works of Canada, the United States and [illegible] of Europe, allowing for transportation.

It may therefore be said that this question is making great progress and there is reason to hope that, in no very distant future, it will give rise to an important industry.

Articles on the Ruthenburg process have appeared in the following publications : "Electro Chemist & Metallurgist," March, 1902 ; "Scientific American," 1st November, 1902 ; "Iron Age, 25th September, 1902 and 19th February, 1903" ; and "Electro Chemical Industry," February, 1903.

A consignment of 110 tons of the raw sand, from the Moisie, has been shipped for concentration and agglomeration to Lockport, N. Y. where practical tests of the process are being made.

It is announced that an American company, under the name of the "Canadian Steel and Coal Co.", will be organized to work a 4000 acre block of land that is supposed to contain magnetic sand, on the east side of the river Natashquan, to the north of the surveyed lots. This company is also said to own a large tract of coal lands in Cape Breton, (Nova Scotia).

There is nothing new to be noted in regard to titanic iron. The experiments looking to its industrial utilization are still being carried on.

The Canada Iron Furnace Co., at Radnor, and John McDougall & Co., at Drummondville, had each one blast furnace in operation respectively during 300 and 250 days, with the following total results in tons of 2,000 lbs.

Ore charged (mostly bog ore)............	18,534 tons.
Limestone, charged......................	1,742 "
Charcoal, charged.......................	103,952 bushels.
Pig iron turned out	7,970 $\frac{1748}{2000}$ tons.

Worth at the furnace $181,500.25 ; the number of men employed being 80. The ore used comes from the counties of Champlain, St. Maurice, Joliette, Nicolet, Drummond and Vaudreuil.

OCHRE.

The two companies, the Canada Paint Co. and the Champlain Oxyde Co., preparing ochre at St. Malo, county of Champlain, worked as usual during the six summer months, producing 1,555 tons of burnt ochre, valued at $18,175, which were utilized in Canada or shipped to the United States and England. An average of 53 men was employed in these works. The Canada Paint Co. also continued to work during the summer the mine of sulphate of baryte at Hull, taking out 353 tons, which the company uses up in its paint works at Montreal.

CHROME.

During the year, the only important workings were those done by Jos. Nadeau & Co., and the American Chrome Co.

On lot A 16 of Coleraine, Messrs. Jos. Nadeau and Richard Topping, worked regularly, each on his own account, the mine which I have described in former reports, operating without machinery and with the aid only of horse derricks and some fifteen men, the ore being partly shipped by way of Thetford. The quality is always the same, that is to say, chiefly of 50°/₀.

The Lemelin & Carrier mine, situated on lot A 17 of Coleraine, was not worked this year.

The Boston Chrome Company's, mine on lots B 6, 7, was regularly worked during most of the year, all the ore being sent to the concentration mill established towards the close of 1901. This mill, which I have already described, seems to have yielded good results and has turned out a quantity of good grade concentrates, which is regularly shipped every week to Boston, to the works of the company, which makes a specialty of manufacturing the chromic acid used in leather tanning. The mill's capacity is to be increased by the addition of five more stamps and a proportionate number of concentration tables. This company, composed of the same persons, is now known under the name of the *American Chrome Co.*"

The Coleraine Mining Company, after a pretty long period of inactivity, has made new arrangements and the works will henceforth be carried on under the name of *The International Chrome Mining and Milling Co. Ltd. New York.* Towards the close of the year, it worked at pumping out the No. 1 and Caribou shafts and putting the plant in order ; suitable changes will be made on the concentration works and it is proposed to replace the crushing rollers by a battery of 5 stamp mills and the jiggers by a Wilfley table. It is therefore probable that there will be a regular output in 1903.

The Montreal Chrome Iron Co. which works at Little Lake St. Francis, has, this year, completed the installation of its concentration mill which was tested and then slightly altered. It is now composed of ten stamps and concentration tables with the usual accessories ; it seems that the results have been satisfactory and it is hoped that this company will make regular shipments in 1903.

Some prospecting was done during the year on lot III, 25, of Coleraine, by Messrs. Alex Boudreau & Co.

Te total shipment of chrome during the year, both in the forms of concentrated and of rock amounted to 900 tons considered first class and worth $13.000 at the mine, the number of men employed being about 40 during most of the year ; there remain on hand about 300 tons of first class and a large quantity of ore to be put through the mills. The price has kept at the same figure.

From Buckingham, 83 tons of ferro-chrome prepared with the Coleraine ore were shipped.

According to all the probabilities, the output of 1903, will be pretty large, especially in concentrated ore, if the three mills are kept going.

COPPER.

The only producers of copper ores, during the year, were the Eustis and Nichols Companies of Capelton, with a small quantity taken from the development works at the Ascot mine and a few car loads of specimens shipped from the Memphremagog mine. The output amounted to 31,938 tons of 2,000 lbs, worth $121,170 at the mine, 250 men having been employed during the year. Of this quantity, 13,152 tons were shipped to the United States and the remainder was utilized at Capelton.

The Nichols company only worked shaft No. 1 this year and used up all its own ore, together with a part of that of the Eustis mine, in its sulphuric acid and chemical works. This company also employed as a test a little of the [illegible] from the Ascot and Memphremagog mines and seems disposed to test all ore that may be sent to it from other mines.

The Eustis mine was worked with the same success as in the past. This company built in the fall a dam on the Coaticook river at a distance of about two miles from the mine in order to utilize the water power at that point and to convey the power to the mine where electric machines will be used in 1903.

At the Ascot mine, the development work was continued under the name of Wilfred Johnson & Co., with a small output of some hundreds of tons of good grade ore, a part of which was shipped to Capelton for trial.

The Norton and Silver Star mines, as well as the King mine, were slightly developed and it is in contemplation to work them later and to organize a company for the purpose.

From the Memphremagog mine, some car-loads of ore were shipped as specimens.

The old Balrath mine, on lot II. 4, of Melbourne, was re-opened in order to take out specimens and to examine the old workings, at a depth of 620 feet. There is also some talk of re-opening the old Victoria mine in VIII 4, of Ascot, and an old mine formerly worked in St. Sylvester.

Some prospecting was also done on other properties, and it is proposed to establish a custom smelter in the Sherbrooke region. Should this undertaking succeed, it would lead to the re-opening of old copper mines, which would thus find a local market for their different varieties of the ore.

Lot VIII 15 of Thetford, where a little chalcopyrite was already found in a dioritic rock some ten years ago, was also prospected.

Matane Mine.—In my reports of some ten years ago I pointed out, in the townships of Tessier and St. Denis, county of Matane, the presence of numerous grains of native copper, firstly in the boulders and then in the diorites which form the foot hills of the Shick-Shock Mountains, five or six miles from the St. Lawrence. During the winter of 1901-1902, Mr. J. E. Saucier, of Matane, undertook to prospect this region and his searches were rewarded by the discovery of a deposit of copper sulphide, principally of the bornite or purple ore variety, mixed with a little chalcopyrite.

I visited these works in the beginning of June, 1902. They are located on lot VI, of the township of St. Denis, at about six miles from the St. Lawrence, but at about twelve miles from the village of Matane, the altitude being about 500 feet above sea level.

I found in a shaft 30 feet deep on the left bank of and quite close to little Gagnon brook, an appearance of a vein running N. E., with the stratification of the schists and seeming to be in contact with a band of diorite. The substance of the vein is a blackish calcite 4 to 5 feet thick, in which the copper ore is disseminated, with the bornite in the centre and the chalcopyrite near the walls. I was unable to ascertain whether this deposit offered any lasting prospect, as I saw n other out-cropping of the sulphate on the surface and the deepening o the shaft had to be abandoned owing to flooding by the water of the brook.

At the time of my visit, two other openings had been made in th diorite, one of which, about 250 yards to the east, was then a doze feet deep and showed many small seams of native copper mixed wit a carbonaceous matter called antraxolite. According to the assay made, the native copper contains neither gold nor silver.

Since my visit, the miners organized under the name " *Th* *Matane Gold Copper Mining Co.*" have continued to work regular with some 15 men. A small steam plant, from " The Jencke Machine Co." of Sherbrooke and composed of a boiler running hoisting machine, a pump and steam drills, has enabled them sink a vertical shaft of 125 feet located at 250 feet to the south of th first shaft. The miners claim to have struck the substance of a ve similar to that on the surface at a depth of 70 feet and at 1 feet they have begun to run drifts to explore and reach the ore bod I have been shown specimens of bornite and chalcopyrite said to ha come from this shaft and which are similar to those noted in the fi prospecting work. This shaft is known as No. 3. Shaft No. 2, whi had been commenced in the diorite, has been abandoned witho yielding other indications than those on the surface.

Among the indications of native copper found on the surface, may mention that on the land belonging to Mr. John Harrison, piece of native copper, weighing from 4 to 5 lbs., appears to have be found, of which a fragment of about 1 lb. was shown to me. On beach, near the Little Matane river, Mr. Baptiste Thibault found rolled specimen, covered with green carbonate and composed cuprite or red oxyde of copper (89°/o of copper) and native cop weighing ten ounces.

I give below some assays made by Mr. Milton L. Hersey of specimens obtained by me and sent to the office :

Copper °/₀............	12.78......	14.53......	13.71......	24.73
Gold (ounces per ton)..	0.04......	0.08......	0......	traces.
Silver " " ..	4.08......	5.08......	5.04......	1.06

The three first specimens represent the average of the ore found, the metallic part being bornite ; the commercial value of the ore would be about $30 per ton.

The last was a picked specimen, containing 37. 7 °/₀ of metallic parts.

I have had in my hands other assay certificates showing higher values and some even very high, but I only mention here those made on specimens identified by myself.

Without prejudging the future of this discovery, I have encouraged the prospectors to continue their workings by seeking to ascertain whether this deposit of copper sulphide does not recur at some distance, which would warrant the supposition of the existence of a regular deposit.

The Geological Survey at Ottawa classifies these lands as belonging to the Cambrian formation, called the Sillery and Levis, while 15 miles to the southward, a Pre-Cambrian band, embracing the Shick-Shock mountains, is pointed out. There is no question of dioritic rocks, which native copper is found and which, to my mind, may belong rather to the Pre-Cambrian or better the Huronian, which thus comes closer to the river.

Following the preceding discoveries, a certain number of prospecting licenses were granted in the region in question, but, practically, no new discovery has been made.

LEAD.

The only mine of galena worked in the province was that at Lake Temiscamingue. It was not visited this year, but, according to the information received, it was worked about the same as last year and shipped 300 tons of concentrated ore, grading 70 to 77°/₀ of lead, and 15 to 17 ounces of silver to the ton.

GOLD.

The Gilbert River Gold Fields Co. has continued the work on lot 14 mentioned in my last year's report and in the spring it washed the gravel, which yielded a little gold. For reasons of which I am ignorant, the work in the new shaft was abandoned and the company prospected in the river on the old workings towards Nos. 19 and 20. The company gave up work in November, to resume it probably this spring.

In the Dudswell region, some prospecting was done on Big Hollow brook, but without great result.

The quantity of gold taken out in Beauce is approximately estimated at 300 ounces, worth $5,400, some thirty men being employed.

ASBESTOS.

In last year's report, a summary of the progress of this industry was given, which showed the great development it was undergoing. During the year 1902, the workings were continued with similar activity; but, owing to an excess in the production, the prices fell off slightly and the total shipment was a little less than that of last year. Practically, all the mines were in operation during the greater part of the year and the fibrizing mills were completed and in successful operation. Towards the end of the year several companies reduced their working staffs and some of them shut down their works on account of the bad season and also of the scarcity and high price of coal occasioned by the strike in the United States. It is to be hoped that, when the arrangements for utilizing the water power of the river St. Francis, at Disraeli, will have been completed, the companies may be able to employ the electric power that that company will convey to Thetford and Black Lake, and to thus protect themselves against such unpleasant eventualities in the future. The installation of the machinery and the laying of the wires will probably be completed in 1903.

There are hardly any new facts to be noted at Thetford; I may, however, cite the progress made by the Bell Asbestos Co., which, to open up new sections of its territory, successfully employed a steam shovel to remove the earth from the surface covering the serpentine, thus realizing a great saving of time and money as compared with the old system which consisted in doing this work by hand.

The King, Bell and Johnson companies worked during the greater part of the year with a similar output. The Beaver Asbestos Co. also obtained good results, but on a smaller scale. Towards the close of the year, this company became the property of *The New England and Canadian Asbestos Company, of Providence, R. I.*, which also purchased the mines worked by the Canadian Asbestos Co., that is to say, the Black Lake mine and the Fraser mine in Broughton ; hereafter these three mines will be worked under one and the same management.

At Black Lake, the Union Mine, Canadian, Johnson, Manhattan, Standard, and Kerr Companies were in operation during part of the year and the Reed mine was also worked a little. At the Union mine, the plant installed on the large pit, to the north-east of the property, by placing several cable derricks abreast, worked successfully and economically in greatly developing that excavation. At the Johnson mine, the mill erected at the end of 1901 was tested and, after some practical alterations, worked regularly. The work at the Canadian and Manhattan mines was done in the same way, prospecting on the top of the hill having led to the discovery of new parts rich in asbestos. The Standard Co. completed the installation of its mill and worked during a part of the year. The Kerr mine was operated on a small scale with a steam boom derrick ; the workings being downwards in the old opening and yielding very good results ; the asbestos found being abundant and of fine quality ; the erection of a fibrizing mill on this property is contemplated. The Reed mine was worked but little during the year and with the usual results.

The East Broughton Co. operated during part of the year, the mill working well.

At Danville, the mine and the small mill worked regularly and the work on the large 6 cyclone mill is sufficiently advanced to warrant the hope that it will be in operation in the spring of 1903. The capacity of this mill is double that of the actual one. As in the past, this company makes a specialty of the preparation of asbestic, of which it ships large quantities.

In the Ottawa region, no work was done this year, but it is proposed to organize a new company to develop the Denholm mine on a larger scale.

The total shipment of asbestos for the province foots up as follows, according to the companies' reports, in tons of 2,000 lbs and in value at the mine or mill :

1st (crude)............	**1,319**	**tons**	**worth**	**$ 240,401**
2nd do	**3,131**	**"**	**"**	**305,312**
Fibre.................	**15,502**	**"**	**"**	**412,388**
Paper stock...........	**10,682**	**"**	**"**	**203,869**
	30,634			**$1,161,970**
Asbestic	**9,764**	**"**	**"**	**12,738**
	40,398			**$1,174,708**

There were, 1800 men employed during periods ranging from 4 to 12 months and the amount of wages paid represented $532,000. The average prices of asbestos, during the year, were about the same as last year, though slightly lower for certain qualities.

MICA.

The mica market was very quiet this year, although the demand continues pretty good, but the fluctuations in the prices, and especially their reduction for the large sizes, as well as the increasing use of the scraps for the manufacture of micanite are the causes which affected this industry : the prices for the small sizes are, however, satisfactory. Only a few of the more important mines were worked this year, namely : Blackburn Bros, Wallingford Bros. and Fortin & Gravel, with some other producers of less importance, and it may be said that not more than $\frac{1}{3}$ of the output was shipped.

A new company, *The General Electric Co.*, has opened a large establishment, in which some 300 hands are employed in trimming and cutting the mica mostly for employment in the manufacture of micanite. This year this company only used mica from Ontario, but it has acquired the control of several important mines in Quebec which it intends to work during the summer of 1903.

Blackburn Bros. worked regularly at Perkins' mill with the same success throughout the whole year.

Wallingford Bros. worked a little at Perkins' mill, besides exploring lot IX. 19. of Hull, which shows good indications of mica.

Messrs. Fortin & Gravel continued to develop their mine in Hull mountain which turned out a large quantity of fine mica, a portion only of which was shipped. I visited this mine in the month of August and it then presented a fine appearance. The old shaft was abandoned at a depth of 90 feet and still showed a good deal of mica at the bottom while in the new one, which was sunk in the immediate vicinity to a depth of 50 feet, a mass of mica could be seen in large crystals 20 feet thick, uncovered for a length of 65 and a width of 15 feet, the bottom being also covered with crystals. Crystals weighing 700 pounds were taken out of this mine and some pieces were obtained capable of being cut in sizes of 15'' by 16''. The owners estimate the average size of their mica at 3/5.

This property has been opened for four years and has constantly given excellent results, the work being done by hand with a few men and a horse-derrick. The mica is roughly culled at the mine and conveyed to Hull where it is sized, trimmed and packed. At the time of my visit 5 men were employed at the mine and 5 women occupied in sorting at Hull where there is a large quantity of mica in store.

The mica from this mine is of very good quality. I may again mention that it is on lot VII½ N. 18 of Hull, seven miles from that city, with a good road.

Some work was also done by the following companies: Allan Gold Reef, in Derry; Glen Almond, in Portland East; Vavassour Association, in Hull; F. W. Webster, at the Cascades on the Gatineau: the amount got out was small.

The quantities of thumb-trimmed mica shipped during the year are given below and represent about one third of the total production, about 100 men being employed for periods of from 3 to 12 months.

1/3	64,463	lbs worth	$ 7,364
2/3	27,861	"	7,201
2/4	27,296	"	10,756
3/5	11,772	"	7,578
4/6	890	"	820
5/8	540	"	585
Total	132,822		34,304

PHOSPHATE.

No mining of phosphate was done this year. Mr. J. F. Higginson, gives us the following figures :

The shipments this year were :

535 tons, high grade, at $8 a ton	$ 4,280
326 tons, low grade, at $3.50 "	$ 1,121
861	$5,401

There is still in this region a certain quantity of phosphate which is usually got out at the same time as the mica and which may be estimated at 400 or 500 tons of high grade and 300 or 400 tons of low grade.

The establishment of a chemical fertilizer factory at Buckingham is spoken of.

GRAPHITE.

There was no mining of this mineral this year and only a little prospecting done in the vicinity of Calumet (Argenteuil). It is rumored that several companies are being formed to develop, in the near future, the mines and works at Buckingham and Calumet, by making use of the improvements recently introduced in connection with the concentration of graphite. The quality of Canadian graphite is now fully recognized in the trade and, in view of the increasing demand for that product, especially in electro-metallurgy, everything leads us to hope that we shall soon see the mining and manufacture of graphite become a permanent industry in our province where the raw material exists in such abundance.

Three tons of crude graphite were shipped from Calumet and 21 tons of prepared graphite, valued at $2,100 from Buckingham.

FELDSPAR.

No mining was done this year and only 52 tons, valued at $172, shipped.

PETROLEUM.

In the vicinity of Gaspé Basin, the Petroleum Oil Trust bored some wells in the region of Mississipi brook but without any practical results.

PEAT.

While public attention was aroused last year in connection with the means to be adopted to make up for the scarcity of anthracite coal due to the strikes in Pennsylvania, peat was mentioned as a possible substitute that might be used to advantage and I will now give a few notes respecting what has been and what may be done.

Peat exists everywhere throughout the Dominion, especially in every part of the Province of Quebec, in considerable quantities and is, as a rule, readily accessible by railway or water. The quality generally is good. It is found in swamps which are frequently useless for farming purposes, in sparsely populated localities where wood is so plentiful that no attention has been paid to it. Nevertheless, about 1864, experiments were made on a peat bog in Bulstrode (Arthabaska Co.), with machinery invented by Mr. James Hodges. The machinery was placed on scows in canals cut in the peat-bogs and consisted of a screw of large diameter which cut the peat in front of the scows, at the same time dredging a canal for them; the peat was freed from roots and pieces of wood and then reduced to pulp in a special machine. This pulp was spread out to dry in the sun and cut into small blocks which shrank as they dried.

Judging from the reports of that period the results were satisfactory. The Grand Trunk Railway Company made several trials of this peat and burned some of it in its locomotives. The work was continued for 7 or 8 years and then abandoned for reasons unknown to us.

In 1874 other works were begun near Ste. Brigite and St. Hubert, in the county of Chambly, with the same machinery. Mr. David Aikman, who was connected with the first undertaking, improved the process and it was stated at the time that 20,000 tons were turned out in 1874 and 13,000 tons in 1875, the greater portion of which was used by the Grand Trunk. Operations were continued until 1877 by the Canada Peat Fuel Company. In 1875, another trial was made near Port Levis, in the county of Huntingdon, by the Huntingdon Peat Company, which adopted the Griffin process.

Mr. Aikman, who made a speciality of manufacturing peat, continued to improve his machinery and took out many patents in connection with the pulping, compressing and drying of the pulp, and we have before us a prospectus dated June 1890, in which "The Aikman Carbonized Peat Fuel Company" describes the processes as follows :

"The fuel is made by machinery carried on a scow which is made to float in the bog ; the peat is excavated by a pair of large screw augers which work in front of the bow and deposit it in a well where it is submitted to the action of steam taken from the exhaust of the engine ; it is then brought by an elevator to the squeezer, where it is deprived of about 33 per cent, of water, after which it is broken by revolving teeth, passed through a dryer of a special construction invented for the purpose and delivered into the press in the form of dry dust, which by the action of heat and the screw is brought into a pasty condition, the tar or resin naturally contained in the peat being set free under the pressure, it becomes partially carbonized and issues from the press, in a continuous stick of peat fuel ready for use; it may be two, three, four or more inches in diameter."

The company claimed to be able to produce this fuel at a low figure and claimed that it possessed qualities which made it a very useful product. It is not to my knowledge that the company ever went beyond the trial stage.

In 1901, "The Quebec Combustible Peat Company, Limited," of Fraserville erected a small mill near Cacouna station, on the Intercolonial Railway, in the county of Temiscouata, on a peat-bog at that place. I visited it in the month of July. It consisted of a mixer which fed the peat in pulp to a moulding machine. The peat was mixed with a composition, the basis of which was crude petroleum and other combustible products and it was not pressed but moulded, each brick weighing about two pounds. The capacity of the mill was 15 tons per 10 hours and it was driven by a 20 horse-power engine, the boiler being heated with light surface peat. Eight men were employed, including those who excavated the peat. The company's processes are covered by patents and it was intended to make such improvements, as experience might dictate, to this machinery on trial Unfortunately, in the autumn of the same year, the whole plant, was destroyed by fire.

Finally, quite recently, "*The National Light, Heat and Power Company, Limited,*" of Montreal, with a capital of $1,000,000, was organized for the purpose of working the peat bogs in St. Brigitte, near Farnham and at other points in the province. This company controls the Aikman patents and intends to prepare pressed peat by making use of that gentleman's experience and also of the Hodges process for extracting peat.

Peat is the product of the decomposition of mosses, generally of the genus sphagnum (peat or bog-moss) and other aquatic plants growing in swamps or damp places. The peat presents a more or less compact appearance, according to the more or less advanced stage of decomposition, traces of organism having a tendency to disappear in depth. It has been observed in all peat-bogs that the deepest, that is the oldest part, is more compact and more dense, while the medium zone is spongy still showing the form of the plants in the bog ; finally, in the upper portion, are the plants still living or barely decomposed. The action that has caused the peat-bog still continues in our day, that is to say : the plants dying on the spot decompose slowly while others grow on the surface. This process of transformation is comparatively rapid and is often found to have occurred within periods of a few years. The thickness of the bogs is variable, but is frequently considerable ; thus in Harrington, county of Argenteuil, deposits are said to exist which are 25 feet thick.

As a general rule, it may be said that peat is an inferior fuel ; but, under certain conditions, for instance when coal is as dear as it is now and at a great distance from the points where it is consumed, peat properly prepared may be substituted for soft coal, anthracite and coke. Of course, I refer solely to the compact peat of the lower level, which in its natural state and simply dried in the sun, may be considered as better than ordinary fire-wood as a heat-producer.

The chief objection to the use of peat is the great quantity of water it contains and which, in the spongy parts may attain 90 per cent, while it is as much as 30 per cent in the compact parts. When peat is dried, it is still very hygrometric and re-absorbs pretty rapidly a considerable quantity of water. To obtain good combustible and commercial peat, it is therefore necessary to reduce its volume as much as possible and deprive it, if possible, of this property of absorption. It should then be pressed and good results have been obtained by pressing it while hot after it was partially dried. In some cases, it has been reduced to pulp, which has been dried and even partially carbonized ; subsequent pressure has produced a fuel possessing the necessary properties. This, however, was sometimes too expensive to make the industry a paying one.

The technical question seems thus solved to a certain extent and there remains only the commercial question, which is of vital importance as regards the capital invested.

In European countries, the manufacture of peat fuel is a well established industry, and mention is made of Holland where, in one instance, operations are carried on in a bog of from three to four hundred thousand acres, yielding about a million and a half dollars of merchantable products. Denmark also supplies large quantities of peat to the trade and a single establishment has turned out some fifteen thousand tons per annum for several years. Sweden, Norway, Russia, Germany and France have, for a long time, manufactured peat fuel with profit for domestic, industrial and metallurgical purposes. I would also recall the fact that, in Ireland, which is pre-eminently a peat country, one-seventh of the surface is covered with bogs which supply a portion of the population with fuel.

In all these countries, peat was first used in its natural state, merely dried in the sun, the work being done by hand or by machinery, and was afterwards pressed. It is used as fuel for domestic purposes, for producing steam, for making gas in metallurgical apparatus, especially Siemens' regenerative furnaces ; in the shape of peat charcoal for household use and for metallurgy; as litter in stables where it absorbs the liquid manure ; in packing fruit or produce ; in making beds and saddlery. Finally, it is used for its secondary products, suchas oil, paraffine, &c. It is also proposed to make paper pulp with it.

Thus, it may be seen that the uses of pulp are many and varied, and that in a peat-bog, if the lower layers yield good fuel, the superficial ones, under the name of *moss-litter*, can be used and find a remunerative market. Nevertheless, under present conditions in Canada, the chief point to be considered is the use of peat as fuel.

BIBLIOGRAPHY

We give below the list of the various publications containing interesting articles on peat in Canada and the United States. It is needless to reprint all the articles in those works, which may be found in our leading public libraries, and a mere summary is given here.

The report of the Geological Survey of Canada for 1853, 1854, 1855 and 1856. page 425, contains a paper by Dr T. Sterry Hunt on the peat industry in France at that time, from the standpoint of its products: paraffine, oil, gas, charcoal.

The report for 1863, page 771, gives a description of a certain number of peat bogs in Canada and, we print below an extract concerning those in the Province of Quebec. That report also contains some analyses and mentions some experiments made, previous to that time, in Europe for the use of peat for manufacturing purposes.

The report for 1866, page 284, contains an article by Dr. T. Sterry Hunt, giving a description of a process used by James Hodges, employed in the peat-bogs of Bulstrode, county of Bonaventure.

The report for 1888-89, page K. 93, contains an article by Mr. R. W. Ells. giving a summary of previous works, with the addition of new facts, respecting the operations at St-Hubert, county of Chambly, from 1875 to 1878, with the assistance of David Aikman's process.

"The Journal of the General Mining Association of the Province of Quebec," for 1891, 1892, 1893, contains three articles : one by Mr T. W. Gibson, page 348, on peat in Ontario ; another by Mr. R. W. Ells, page 359, on peat in Ontario and Quebec, and on the industry generally, and a third by Mr. A. A. Dickson, page 394, on peat prepared by the Dickson process.

"The reports from Her Majesty's representatives on the manufacturing of products of peat in European countries" in 1893, is a series of reports made to the Government by British consuls with reference to the use and manufacture of peat in Europe. This report gives many details and figures in connection with the matter from the standpoint of fuel, of the products of peat and of its use as moss-litter.

The first Report of the Bureau of Mines for Ontario for 1891, page 180, contains a remarkable work treating of everything done in connection with peat down to that date from the standpoint of fuel, of its products, of litter, etc, as well as of the experiments, analyses, processes, comparisons with other fuel and interesting suggestions. Persons who have anything to do with peat are advised to read this interesting work.

The reports of the same bureau for 1892, pages 195, and for 1893, page 139, also contain interesting information on the same subject. The report for 1892 publishes at length the articles by Messrs. Ells and Gibson, mentioned above. The report for 1893 contains an article by Mr. Edward Jack on moss litter.

Companies have been organized and work has been done in Ontario for the utilization of peat and the Government was to publish a full report on the result of the operations. For reasons unknown to us, this publication has not yet appeared.

The Quebec *Journal of Agriculture* for May, 1892, (French version), published a very good article by Mr. H. Nagant on peat, its use in agriculture, as a litter, as a disinfectant, for the preservation of animal or vegetable products and as an insulator for ice-houses. Mr. Nagant shows its advantages as an absorbent of ammonia in stables.

" The Mineral Industry " Vol. II, page 489, contains an article on peat generally, and Vol. VII, page 191, an article by Mr. Ernest A. Sjostedt on some ways of preparing peat and on its use. This work, in addition to a good deal of information, treats of Canadian peat.

As may be seen, literature in connection with peat is fairly voluminous, and no mention is made of other papers published in various reviews, newspapers or technical publications, but which are summarized in the articles cited above. The question, it will be observed, is not a new one, but this industry has developed only when trade conditions allowed of it. The critical period, as regards fuel, through which we are passing, has produced a combination of favorable circumstances which lead to the hope that this industry will be developed to advantage in this country.

Following is a description of peat-bogs in the Province of Quebec according to the Geological Survey for 1863.

Grenville.—Lots 4 and 5, 36 acres, depth 10 feet; lot 1 of same range, same extent, maximum depth 15 feet; lot VII, 4, 30 acres.

Harrington.—Lots I, 4 and 5, 40 acres, 10 to 25 feet; V, 1 and 2, 60 acres, maximum depth 25 feet.

Mille Isles Seigniory.—Double range on road from St. Janvier to St. Jérôme, length half a mile, area ⅝ of a square mile, average depth 8 feet, the depth varying from 2 to 18 feet. Another near St. Janvier, a quarter of a mile wide, area and depth not calculated. Another, north of the church of Ste Anne des Plaines on road to New Glasgow, extent one mile, presumed average depth 5 feet.

Seigniories of St. Sulpice and L'Assomption (interior).—3½ miles wide, 1½ mile long, area 1,100 acres, depth 2 to 15 feet, average 10 feet.

Seigniories of Lavaltrie and Lanoraie.—Two large bogs parallel to one another: that on the north (*Grande Savanne*) 8 miles long from N. E. to S. W., from half a mile to 2½ miles wide, area 12 to 15 miles; on the Lanoraie and L'Industrie railway, depth 4 to 14 feet, average 11 feet. The other, two miles from St. Laurent, length over 5 miles, width half a mile to 2 miles, average depth 5 feet, area 3 miles.

Fief St. Etienne.—On St. Maurice river, near *Les Grès*, the road runs through a peat-bog half a mile long, width not ascertained, average depth 5 feet.

Champlain Seigniory.—Three miles from the river St. Lawrence, between the church and Champlain river, ¾ of a mile long by 2 miles wide in a N. E. direction, average depth 5 feet, area 1⅓ mile.

Fief d'Auteuil.—Between Cap Santé and the village of l'Enfant Jésus, width a quarter of a mile ; the other dimensions are not given.

Lacolle.—West of the Richelieu river, a large peat-bog, about twenty miles in superficies, extends through a part of the seigniories of Lacolle and DeLéry and the townships of Sherrington and Hemmingford, and appears to be very deep in some places.

Longueuil.—A large peat-bog, not measured, on the Chambly road; some work was done there before 1863.

Saint Dominique.—5 to 6 miles long by 3 to 4 wide, depth from 2 to 18 feet. An analysis of this peat is given in this report. A portion of this bog was cultivated after the surface was burned.

Rivière Ouelle Seigniory.—A bog covering 4,000 acres.

Rivière du Loup Seigniory.—On the Temiscouata road ; width 1¼ mile, depth 18 feet, area 6,000 acres.

Ile Verte Seigniory, (1st and 2nd concessions).—A little work was done two years ago near Cacouna station by the Quebec Peat Fuel Company. The depth was from 2 to 10 feet and the peat of good quality.

Rimouski.—A peat-bog extends from the town to the Metis river, about 20 miles, width from a quarter of a mile to a mile, depth from 1 to 6 feet.

Duquesne and Macpès.—East of the Rimouski river, 3 to 4 miles long by three-fourths of a mile wide, depth from 5 to 12 feet.

Matane and McNider.—A peat-bog, size not ascertained, between the Blanche and Matane rivers.

Madawaska.—On the left bank of the Madawaska river, area 100 acres.

Anticosti.—On the south side of the island from Heath Point to South-West Point, a distance of 80 miles, a continuous peat-bog of an average width of 2 miles. It has been ascertained that it is fifteen feet above high-water mark, and the depth varies from 3 to 10 feet. Between South-West Point to the western extremity of the island there are several small peat-bogs with an area of from 100 to 1,000 acres.

This list is far from complete; there are also peat-bogs in St' Brigitte, in the neighborhood of Farnham, in Bulstrode (Arthabaska), in St. Luc and St. Prosper (Champlain), on the line of the Lake St. John Railway between Lorette and Valcartier, on the North Shore in the township of Bergeronnes, along the Maritime road, in the peninsula of Manicouagan, at Moisie, Natashquan, Esquimaux Point and in several other parts of the province.

ANALYSIS OF PEAT FROM CHAMPLAIN, DRIED NATURALLY, BY H. NAGANT.

	Surface peat.	Black peat.
Water	12.6	8.8
Ash	2.06	2.3
Organic matter	85.34	88.9
	100.00	100.00

Contains 0.7 per cent of nitrogen.

ANALYSIS OF ASH.

Sand and silica	36.7
Oxyde of iron and alumina	43.9
Lime	4.5
Phosphoric acid	1.47
Potash and soda	0.94
Magnesia	traces

PEAT FROM SAINT DOMINIQUE, (Geological Survey, 1863).

	Compact	Porous
Fixed carbon	29.30	29.57
Volatile matter	63.43	63.68
Ash	7.27	6.75
	100.00	100.00

Ash.

Carbonate of lime	52.410
Sulphate of lime	15.085
Phosphate of lime	2.019
Chloride of sodium	0.412
Sulphate of soda	0.076
Sulphate of potassium	0.605
Lime not in combination	10.431
Magnesia	3.750
Peroxyde of iron	4.680
Oxyde of manganese	0.040
Silica in combination	4.980
Sand	4.040

ANALYSIS OF PEAT PREPARED BY THE AIKMAN AND HODGES PROCESSES.

	Aikman.		Hodges.	
Water	14.83	16.52	17.06	14.96
Volatile combustible matter	50.15	53.29	50.73	59.60
Fixed carbon	28.15	22.48	25.95	22.20
Ash	6.84	7.71	6.27	3.24
	100.00	100.00	100.00	100.00

Below is given the heating power of various fuels in common use, according to analyses made by Mr. Milton L. Hersey, in British thermal units. It should be noted that the "British thermal unit" represents the quantity of caloric required to raise the temperature of a pound of water one degree Fahrenheit, while the metric thermal unit represents the caloric required to raise the temperature of a kilogramme of water one degree centigrade.

American anthracite	7.10	of ash	13,829	B. T. U.
Welsh "	2.88	"	14,781	"
Bituminous Canadian Coal	6.96	"	13,417	"
Bituminous American "	3.23	"	14,114	"
North-West lignite	4.25	"	8.995	"
Quebec raw peat, well dried	3.89	"	8,302	"
Dry maple	0.40	"	8,300	"

Natural peat shrinks in drying from two thirds to four fifths and it takes from 60 to 80 cubic feet of dry peat to make a ton.

MISCELLANEOUS.

During the past year, several persons thought they had found coal in the province but, after examining the specimens and the localities, the hope had to be abandoned. I also visited the region in the vicinity of James Bay where it was claimed that bituminous coal had been discovered and I found nothing but a variety of quaternary lignite, that is to say of inferior quality, having no industrial value in the conditions in which it was discovered.

Nothing has been done in connection with natural gas, but the possibility of discovering this fuel in the central part of the province must not be overlooked. While on this subject I could call attention to an important work by Mr. Eugène Coste on the volcanic origin of natural gas and petroleum, which gives valuable indications regarding searches for those products. That paper was submitted at the meeting of the Canadian Mining Institute.

I also had occasion to visit Gaspesia in connection with alleged discoveries of asbestos on the St. John and Pabos rivers, and I must say that I found nothing to justify the assertions.

I also made inquiries regarding certain presumed discoveries of various minerals, generally of slight importance, and I gave advice to the interested parties in accordance with the result of my investigations.

I have been informed that the deposits of manganese ore in the Magdalen Islands have been transferred to one of the largest metallurgical companies of Nova Scotia. There is therefore reason to hope that these properties will be developed shortly. The ore found on those islands is pyrolusite of very good quality ; iron ore in the shape of limonite is also found there, as well as gypsum.

BUILDING MATERIALS.

Granite.—Granite has been got out in the same regions already referred to, namely Rivière à Pierre, Stanstead, St Samuel, St Philippe d'Argenteuil, Mount Johnson. Progress is being made in this industry and the companies turn out very good granite for the construction of buildings and bridges, as well as for monuments in cemeteries.

Cement.—The Crescent Cement Works Company, whose works are near Montreal, has increased its output this year and intends to extend its works to produce still more.

A Canadian company *The International Portland Cement Company (Limited,) Toronto,* is now putting up cement mills at Hull, in which the limestone rock and the clay in the neighborhood will be treated. This company has already an establishment at Durham (Ontario) and intends to turn out a large quantity at Hull this year. I consider the cement industry a very important one for Canada, as building operations are on the increase with the development of the country and, if we manufacture a product which will compare, as regards uniformity, with imported cement and can be sold at the same price, we have every reason to encourage a national industry.

I have already called attention to the extensive deposits of calcareous marl in several parts of our province, especially in the counties of Rimouski and Bonaventure, which would supply excellent raw material for the manufacture of Portland Cement.

Slate.—The New Rockland quarry was in operation during the greater part of the year and turned out a good quantity of roofing slates.

Flag-stones.—Mr. F. R. Bishop continued to get out these stones at Dudswell with the same results as previously.

Lime.—The manufacture of lime follows the general development of industry, but there is a constant demand for limestone deposits capable of supplying pure rich lime for the manufacture of chemical wood pulp. Many limestone deposits have been mentioned in previous reports as existing in various parts of the province, pure or white limestone being a characteristic feature of the Laurentian formation, north of the St. Lawrence and of the Ottawa.

Bricks.—Brick-making is on the increase ; the new Eastern Townships Brick and Manufacturing Company, of Sherbrooke, was in operation this year. It can turn out from five to six million bricks a year.

Building stone.—This material is being quarried as usual.

In the table of production the same figures as last year are given for lime, brick and building stone, owing to the difficulty of ascertaining the exact output every year; but it must be understood that there is an increase.

The figures for other building materials are based on the companies' reports.

STATISTICS.

The figures given below represent the quantities and values of the raw ore at the mines and at the mill, that is, after it has been prepared by hand or by machinery and put in shape to be sold. Thus asbestos fibre cannot be sold when mixed with serpentine; some ores of chrome, of galena and of graphite must be concentrated; ochre must be calcined: mica trimmed, etc.: gold extracted from the quartz. Other products must also be worked on the spot to obtain, for instance: cement, lime, bricks, slate, etc.

All these operations are, practically, a part of mining and are distinct from metallurgy and from the process of manufacture by means of which the more advanced products are obtained.

I give these explanations to account for the amount of three million dollars representing our production this year, which seems small compared with the productions of other parts of Canada, but I must say that the latter include manufactured products, such as iron, steel, etc; or the value of the metals contained in the ores such as copper, lead, zinc, nickel, silver, etc.

The organization known as the Canadian Mining Institute, has started a movement for the unification of mineral statistics of the various provinces of the Dominion which will thus allow of a fair comparison being made.

The table given below is based on the official reports of mining companies and is checked with the figures of shipments kindly supplied by the railway companies.

SUMMARY STATEMENT OF THE YIELD OF THE MINES IN THE PROVINCE OF QUEBEC FOR THE YEAR 1902.

KIND OF MINERALS. (Tons of 2.000 lbs.)	Wages paid.	Number of Workmen.	Quantities shipped or used.	Gross value.
Magnetic iron ore and hematite	....	....	170	$510
Bog ore	$34,000	80	18,524	54,742
Chrome Iron	10,000	40	900	13,500
Copper ore	69,538	250	31,938	121,170
Galena	12,000	40	300	15,000
Asbestos	532,000	1,773	30,634	1,161,970
Asbestic	....	....	9,764	12,738
Mica, thumb trimmed, lbs	29,175	106	132,822	34,304
Ochre, calcined	7,892	53	1,555	18,175
Graphite, prepared and raw	....	....	24	2,160
Feldspar	....	....	52	172
Sulphate of Baryte	1,925	7	353	2,471
Phosphate	....	....	881	5,401
Gold (ounces)	9,250	30	300	5,400
Slates (squares)	10,000	38	4,800	19,200
Flag-stones (square yards)	1,500	7	3,000	2,550
Cement (barrels)	26,000	75	36,000	61,000
Granite	55,000	220	....	160,000
Lime (bushels)	....	350	1 million	140,000
Bricks	600,000	1.200	120 millions	625,000
Stone	....	700	....	530,000
	1,338,380	4,969	....	2,985,463

Thus the mines and quarries yielded, in 1902, raw products or products prepared to a certain extent at the mine to make them saleable, of the value of three million dollars. Workmen to the number of 5,000 were employed for periods of from three to twelve months, and their aggregate wages amounted to about one million four hundred thousand dollars.

Moreover 7,971 tons of charcoal pig-iron worth $181,500 were manufactured in the province, out of native ores, and 83 tons of ferro-chrome, worth $1,930 were shipped. The copper ores have produced a certain quantity of sulphuric acid and copper matte, the value of which I do not know.

SHIPMENTS BY RAILWAY COMPANIES.

QUEBEC CENTRAL

Bricks	9,798	tons of	2,000 lbs.
Lime	9,102	"	"
Flag-stones	1,401	"	"
Chrome	900	"	"
Asbestos	25,025	"	"
Asbestic	5,445	"	"
Granite	335	"	"
Cement	20	"	"

BOSTON & MAINE

Stone and sand	11,672	tons
Copper ore	24,995	"
Cement	107	"
Lime	28	"

MAINE CENTRAL

Stone and sand	1,270	tons
Cement	20	"
Bricks	77	"
Lime	10,877	"

OTTAWA NORTHERN & WESTERN, (formerly the Ottawa and Gatineau Valley, R. R., and Pontiac and Pacific Junction R. R.):

Phosphate of Lime	177	tons
Mica	2,540	lbs
Asbestos	2,290	"

CANADIAN PACIFIC

Bricks, lime and cement	28,689	tons
Stone	30,803	"
Bog ore	16,422	"
Mica	24	"
Graphite	24	"
Phosphate	379	"
Asbestos, (in transit viâ Sherbrooke)	5,123	"
Copper ore, " "	140	"
Feldspar	55	"
Sulphate of Baryte	324	"
Ferro-Chrome	83	"

QUEBEC & LAKE ST. JOHN

Bricks	54 cars
Stone	947 "

INTERCOLONIAL

Iron ore	90 tons
Stone	191 "
Lime	4,350 "
Bricks	2,183 "
Sand	71 "

LIST OF MINING COMPANIES IN THE PROVINCE OF QUEBEC IN OPERATION OR IN A POSITION TO WORK DURING THE YEAR, WITH THEIR ADDRESSES.

IRON

Chs. Lionais, Kinnear's Mills, Co., Megantic.
J. O. Hibbard, 84, Argyle Avenue, Ottawa.
H. C. Bossé, 20, St. James street, Quebec.

CHARCOAL PIG-IRON.

The Canada Iron Furnace Co., Canada Life Building, Montreal.
John McDougall & Co., 597, William Street, Montreal.

OCHRE

The Canada Paint Co., 572, William Street, Montreal.
The Champlain Oxyde Co., (Lucien Carrignan), Three Rivers.

CHROME IRON

International Chrome Mining & Milling Co., Black Lake, Co. Megantic.
Montreal Chrome Iron Co., Ltd., Colraine, Co. Megantic.
American Chrome Co., Black Lake, Co. Megantic.
Jos. Nadeau & Co., Black Lake, Co. Megantic.
L. A. Carrier & Co., Levis.
R. T. Hopper, Canada Life Building, Montreal.

COPPER

Eustis Mining Co. Eustis, Co. Sherbrocke.
The Nichol's Chemical Co., Ltd., Capelton Co. Sherbrooke.
Wilfred Johnson & Co., Sherbrooke.
C. E. Kennedy, Suffield, Co. Sherbrooke.
James Reed, Reedsdale, Co. Megantic.
The Matane Gold Copper Mining Co., Matane.
F. D. Kelley, 147 Milk Str., Boston, Mass.
A. O. Norton, 280, Congress Str., Boston, Mass.

LEAD, ZINC, SILVER

The British Canadian Lead Co., Ltd., Lake Témiscamingue, Co. Pontiac.

GOLD

The Gilbert River Gold Fields, Ltd., St. Francis, Co. Beauce.
Dominion Mining Co., C. A. Parsons, 154, Commercial Street, Boston, Mass.

GRAPHITE

The Walker Mining Co., Graphite City, Buckingham, Co. Ottawa.
The North American Graphite Co., Ltd., Buckingham, Co. Ottawa.
The Buckingham Co., Buckingham, Co. Ottawa.
Keystone Graphite Co., Calumet, Co. Argenteuil.
Calumet Graphite Co., Calumet, Co. Argenteuil.

ASBESTOS

Bell Asbestos, Co., Ltd.—Thetford, Co. Megantic.
King Bros. Co., Ltd.—Thetford, Co. Megantic.
Johnson's Co.—Thetford, Co. Megantic.
W. R. Kerr & Co.—Black Lake, Co. Megantic.
Standard Asbestos Co., Ltd.—Black Lake, Co. Megantic.
The New England Canadian Asbestos Co.—Black Lake, Co. Megantic.
Union Asbestos Mine.—Black Lake, Co. Megantic.
Manhattan Asbestos Co.—Black Lake, Co. Megantic.
James Reed—Reedsdale, Co. Megantic.
The Broughton Asbestos Co.—East Broughton, Co. Beauce.
The Asbestos & Asbestic Co. Ltd.—Danville, Co. Richmond.
The Ottawa Asbestos Mining Co.—514, Sussex Str., Ottawa.

PHOSPHATE

J. F. Higginson—Buckingham, Co. Ottawa.

PETROLEUM

The Petroleum Oil Trust Co., Ltd.—Gaspé Basin, Co. Gaspé.

FELDSPAR

W. A. Allan—Victoria Chambers, Ottawa.

SULPHATE OF BARYTE

The Canada Paint Co.—572, William Str., Montreal.

PEAT

The National Light, Heat & Power Co. Ltd.—Canada Life Building, Montreal.

SLATE

New Rockland Slate Co.—New Rockland, Co. Richmond.

FLAG-STONES

F. R. Bishop—Bishop's Crossing, Co. Wolfe.

CEMENT

Crescent Cement Works, Th. M. Morgan.—Longue Pointe, Montreal.
The International Portland Cement Co. Ltd.—Hull, Co. Ottawa.

GRANITE

Stanstead Granite Co.—Beebe Plain, Co. Stanstead.
S. B. Norton, do
James Brodie, do
The Whitton Granite Quarry Co.—St-Samuel, Co. Compton.
M. Fitzgerald.—Ste-Cécile, Co. Compton.
Jean Voyer & Fils.—Rivière à Pierre, Co. Portneuf.
Joseph Perron.—Rivière à Pierre, Co. Portneuf.
M. P. Davis.—565, Rideau Str., Ottawa.
The Laurentian Granite Co.—St-Philippe, Co. Argenteuil.
J. A. Nadeau.—Iberville.

MICA

Wallingford Bros., Perkins Mill, Co., Ottawa.
Blackburn Bros., 46, Sussex Str., Ottawa.

Fortin & Gravelle, Hull, Co. Ottawa.
Mica Manufacturing Co. Ltd, 213, Dalhousie Str., Ottawa.
Vavassour Mining Association (T. F. Nellis), 22, Metcalfe Str. Ottawa.
Lila Mining Co., (D. L. McLean), 5, Sparks Str., Ottawa.
Chs. Guertin, 398, Wellington Str., Ottawa.
E. B. Haycock, 49, Cooper Str., Ottawa.
Brown Bros., Cantley, Co. Ottawa.
Angus Cameron, Buckingham, Co. Ottawa.
Lewis McLaurin, East Templeton, Co. Ottawa.
Richard Moore, Pickanock, Co. Ottawa.
Joshua Ellard, Pickanock, Co. Ottawa.
The Glen Almond Mica & Mining Co., Buckingham, Co. Ottawa.
The Allan Gold Reefs Co. of Ontario, Ltd.—Victoria Chambers, Ottawa.

PURCHASERS OF MICA.

Sills Eddy Mica Co., 398, Wellington Str., Ottawa.
Eugène Munsell & Co.. 332, Wellington Str., Ottawa.
General Electric Co., Isabella Str., Ottawa.

BRICKS (the principal companies).

Thos. W. Peel & Co., Montreal.
J. Brunet & Co., Montreal.
Chas. Sheppard & Son, Montreal.
Joseph Bernier, Montreal.
Joseph Descarries.—Montreal.
Laprairie Pressed Brick Co.—Laprairie.
Narcisse Blais.—Quebec.
Frs Grenon.—Quebec.
Paradis & Létourneau.—Quebec.
Laliberté & Fils.—St. Jean Deschaillons, Co. Lotbinière.
G. V. Charland.— do do
D. G. Loomis & Son.—Sherbrooke.
Eastern Townships Brick & Manufacturing Co.—Sherbrooke.

LIME (the principal companies.)

Dominion Lime Co.—Dudswell.
F. G. Brigham.—Ottawa.
H. Gauthier & Co.—Montreal.

Cyrille Gervais.—Montreal
Olivier Limoges.—Montreal.
Montreal Lime Co.—Montreal.

GOVERNMENT ASSAY LABORATORY, MONTREAL

Mr. Milton L. Hersey, provincial analyst, of Montreal, reports that many persons interested in the mines of the province have taken advantage of the low tariff charged by the Government. During the year, 306 assays were made and reported. Moreover, a great many specimens were identified and assayed for persons who personally visited the laboratory and in many instances, opinions were given free of charge, Mr. Hersey estimates that not less than 350 identifications and consultation were thus given.

The following analyses and assays were completely made.

Drinking water..........	2	samples, (including bacteriological examinations).
Bituminous coal..........	1	specimen
Mineral waters...........	7	samples
Asbestos..................	2	specimens
Peat......................	1	"
Iron ore..................	2	"

The following identifications were made :

Gold, 63 ; silver, 62 ; iron, 19 ; titanium, 25 ; silica, 1 ; moisture, 2 ; alcohol, 1 ; chrome, 5 ; copper 27 ; insoluble substances, 1 ; nickel, 4 ; cobalt, 4 ; sulphur, 6 ; anthraxolite, 1 ; asbestos, 3 ; platinum, 2 ; graphite, 2 ; peat, 1 ; marl, 1 ; phosphate 2.

The public documents in this office were also consulted frequently.

The tariff of fees is given below :

MILTON L. HERSEY, M.Sc., GOVERNMENT ASSAY LABORATORY,

146, *St. James street, Montreal, Que.*

FEES FOR ASSAYS AND ANALYSES.

		4 Samples or less at one time each.	More than 4 at one time, each.
Gold		$1.00	$0.90
Silver		1.00	0.90
Gold and Silver		1.00	0.90
Copper		1.00	0.90
Lead		1.25	1.15
Zinc		1.50	1.35
Nickel		2.00	1.80
Platinum		2.00	1.80
Arsenic		2.00	1.80
Manganese		2.00	1.80
Chromium		2.00	1.80
Antimony		2.00	1.80
Bismuth		2.00	1.80
Silica	smelting quality of iron ores.	1.00	0.90
Iron (metallic)		1.00	0.90
Phosphorous		2.00	1.80
Titanium		1.50	1.35
Sulphur		1.50	1.35
Alumina		1.50	1.35
Ferric Oxide		1.00	0.90
Lime		1.50	1.35
Magnesia		1.50	1.35
Graphite		1.50	1.35
Moisture		0.25	0.25
Combined Water		0.50	0.50
Insoluble Matter		0.50	0.50

Identification of minerals.—The laboratory is prepared to issue a report on samples, giving description as far as may be determined by rough qualitative tests, with the probable metallic contents or commercial value of the sample. A nominal fee of 25 c. is charged for each sample.

MAGNETIC CONCENTRATION OF IRON ORES

With the authorization of Dr. W. L. Goodwin, director of the Kingston School of Mines, (Ont.). Mr. J. WALTER WELLS, B. L. C. M. & CH. E. kindly made, in that laboratory, a series of assays of the iron ores of this province. The results are published below together with a summary of an interesting paper written by him on the subject.

The complete work and accompanying photographs are deposited in the office of the Bureau of Mines where they may be consulted.

Mr. Wells states that the production of iron is increasing, that the productive sources of the ore are limited and that far-seeing manufacturers are trying to secure new mines or to utilize old ones hitherto neglected, amongst others those of low grade iron ores which, in order that they may be conveyed with profit to points of consumption, must be enriched and purified on the spot.

In 1901, the output in the United States was 15,878,864, long tons of pig-iron, worth $242,174,000, to produce which 28,887,479 tons of iron ore were required ; the figures being about double those of 1896.

In 1900, the output in Canada was 86,090 long tons of pig-iron, and in 1901, 244,976 tons. These figures are sufficiently eloquent of themselves and suffice to call attention to the subject.

The concentration or enriching of ores is based, as a rule, on the difference in density and the known hydraulic processes may be applied to certain ores that are fairly pure and mixed with lighter rocks, but they become insufficient, for instance in the case of magnetic oxydes of iron mixed with pyrites, titanic iron, &c., and herein lies the advantage of magnetic concentrators.

As iron-masters have preferred to use rich and pure ores, requiring less fuel, less flux and less manual labor, I would recall the fact that the ores most sought after and known as Bessemer ores, have a base of at least 63 % of iron and 0.045 % of phosphorus and 0.05 % of sulphur at the most.

In practice, in the case of blast furnaces, it is calculated that it takes a ton of coke to make a ton of pig-iron, and most metallurgists admit that about 400 lbs. of coke are sufficient to reduce the oxydes of iron, the remaining 1,600 lbs. being required to melt the iron and the earthy silicates that constitute slag, a portion of the excess of heat being moreover used in producing gases which are afterwards utilized.. As the blast furnace may be looked upon as a smelting and concentrating apparatus, it will therefore be found advantageous to first concentrate the ore if circumstances permit, and if there is no competition with another ore naturally rich and pure and in proximity to the furnaces: all which things constitute the commercial part of a metallurgical undertaking.

In concentrating an iron ore, the concentrated grains should be as large as possible considering the circumstances. In the case of non-magnetic and pure ores, various apparatus for washing and clearing are used in certain places, as well as the jiggers ; but when the ore is magnetic, it will be found advantageous to use a magnetic concentrator. Nevertheless, even in the case of hematite, the ore is separated by increasing the strength of the magnets by means of an electric current.

Magnetic ores have been classified in the following order, the most magnetic heading the list:
Magnetite (Sesquioxyde of iron).
Franklinite (Oxyde of iron and zinc).
Ilmenite (Oxyde of titanium and iron).
Pyrrhotite (Sulphuret of iron).
Hematite (Peroxyde of iron).
Siderite (Carbonate of iron).
Limonite (Hydrated peroxyde of iron).

The concentration of these ores presents a special problem in the case of each one, wherein the strength of the current to be employed must vary, thereby necessitating the use of merely magnetic or electro-magnetic apparatus.

Mr. Wells claims to have succeeded, in the case of some kinds of titanic iron, in separating magnetite from ilmenite, which is less magnetic.

The apparatus should likewise be classed, into composite ones, treating by a hydraulic and magnetic method and those treating the dry ores, using magnets and electro-magnets, some with the aid of small ventilators.

In 1865, an attempt was made to separate the ore in the magnetic sands of the North Shore by a magnetic process (that of Dr H. LaRue).

Mr. Wells classifies the magnetic separators in four groups :

1. Apparatus in which the ore is carried on an endless belt running through a magnetic zone which carries off the concentrated ore while the main belt carries away the refuse. The magnetic zone may be formed by an endless belt or by revolving cylinders. Some machines, based on this principle, are known under the names of Conkling, Wetherill, Chase, Hoffman, Kessler, etc. All these have been used, especially the Wetherill which is in pretty general use.

2. Apparatus in which the ore falls on a revolving cylinder passing in a magnetic zone formed by a section of a fixed inner cylinder ; the refuse falls vertically while the magnetic parts are carried off by the outer cylinder and fall into a reservoir when the magnetic zone is passed. These apparatus may also include a pair of cylinders, revolving in opposite directions, instead of only one. The following may be mentioned : Ball-Norton, Heberli, Wenstron, Buchanan, Sautter, Siemens, Payne, etc., which have also been used.

3. Apparatus in which the ore, falling vertically, passes at a certain distance from a magnetic zone which causes the magnetic part to deviate from the vertical ; it does not adhere to the magnet and falls into a special reservoir, while the non-magnetic portion has gone its own way and falls into another reservoir. The Edison, Heberli, Grondal-Delvick, Rowand and other apparatus have also been in use, especially the Edison, used by the celebrated electrician in his New Jersey works.

4. Apparatus in which static electricity is employed ; such, for instance, is the Blake-Morscher separator, consisting of a metal plate charged with electricity over which the crushed ore passes ; the ores that possess high conductivity are repelled and thus isolated from those that have low conductivity.

Mr. Wells gives a description of some of these apparatus and mentions where they have been used. I therefore refer to the original work for further details.

The question of using the ores crushed or in the shape of fine sand is also dealt with.

It seems admitted that the trouble, as regards pulverulent ores, lies in the irregular descent of the charges in blast furnaces, causing an imperfect reduction of certain portions, the formation of gas pockets and the carrying off of the fine dust with the current of gas, thereby occasioning loss. This has led to the agglomeration of the ores. Nevertheless, certain blast furnaces are mentioned in the Pittsburgh region which use the friable ores of Mesabi without too much trouble ; in others a certain portion of concentrated ore has been used containing as much as 30 and even 50 per cent mixed with ore in lumps and, in some cases, they have not hesitated to use exclusively ore a quarter of an inch in diameter. In Sweden and Germany successful trials have been made in connection with the use of fine ores. Nevertheless the experiments made as regards the agglomeration of fine ores, by making compressed briquets with a mixture of adhesive products, are being continued and the use of molasses, sugar, tar, resin, silicate of soda, clay, lime, &c., as agglomerating matter, has been suggested ; but, with the exception of certain ores and in certain special cases, these methods do not appear to have had practical results. Briquets have also been made of ore and coal dust which are first treated in coke ovens.*

The Ruthenburg method which consists in fritting the magnetic ore in an electric furnace and which is described in this year's report, seems well adapted for the use of the magnetic sands of the North Shore.

Mr Wells has made experiments with the ores of the Province of Quebec and has obtained satisfactory results as follows :

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* I would remark, that, in the Radnor Forges, briquets have been used made of ochre and fine ore or sand and it has also been proposed to use compressed peat as agglomerater.

OPPORTUNITIES IN QUEBEC FOR MAGNETIC CONCENTRATION OF IRON ORE.

As there seems to be an immense quantity of low grade magnetic iron ore in the Province of Quebec, it was thought that a few experiments might be of value to see if this ore could be concentrated. A very objectionable constituent of many of the Quebec ores is a large amount of titanium, and all the ores tested carried titanium.

The results of the experimental separations are given in detail.

Sample A consisted of beach sand from Natashquan on the north shore of the St. Lawrence river and contained quartz, ilmenite, magnetite, garnets, etc. Most of the grains are of the same size, all passing through 0.10″ sieve. The sand was passed through a Wetherill magnetic separator and the results are what may be expected in actual commercial operations as no attempt was made to secure the cleanest possible concentrates.

Current used —0.8 amperes ; pole distance, that is distance of magnet from ore, 2″

	AVERAGE ORE.	HEADS.	TAILS.
Weight	26 ounces.	3 ounces.	23 ounces.
Metallic iron	17.87%	62.97%	8.08 %
Phosphorus	0.035%	0.02%	0.09 %
Sulphur	0.031%	0.014%	0.043%
Titanium dioxid	4.94 %	3.74%	5.58 %
Corresponding to titanium		2.25%	

The iron values are the iron soluble in hydrochloric acid which represent the available iron ready for conversion into pig as the iron in combination with silicates and titanates is likely to go into the slag. The results show that an ore of Bessemer grade can be got from this iron bearing sand, getting 1 part ore from 8 parts sand. It is possible to still further reduce the titanium in the heads by losing iron in the tails, but this is not necessary as most of the iron smelters will allow 5% titanium dioxid in ores (*) the only objection to it being that it does not fuse readily in the furnace and often causes trouble as well as using up considerable fuel.

(*) The responsibility for this statement rests with Mr. Wells, for it is not to my knowledge that iron smelters allow in their charges any ores containing 5% of titanium dioxid corresponding to 3% of titanium. J. O.

As this sand is found on the shores of the St. Lawrence river, it is more or less wet and should be best treated in a separator adapted to handling ores in water, such as the Grondal-Delwik, Heberli or Chase machines. It certainly would not pay to dry the ore before separation as this would mean a considerable expense.

Sample B consisted of beach sand from Natashquan, but very rich in iron as very little siliceous matter was present. The grains are all about the same size passing a 0.10″ mesh and most of the ilmenite is in detached grains separate from the magnetite. The iron values are "available iron", as no account is taken of the iron in combination with silicates, &c.

Current used 0.8 amperes, distance of poles 2″.

	AVERAGE ORE	HEADS	TAILS.
Weight	7 ounces	3 ounces	4 ounces
Metallic iron "available"	59,89 %	70.07 %	49.93 %
Sulphur	0.028 "	0.014 "	0.09 "
Phosphorus	0.041 "	0,026 "	0.86 "
Titanium dioxid	11.91 "	2,07 "	24.02 "
Corresponding to titanium		1.25 "	

The results show a concentration of practically 2 parts of crude ore into 1 of concentrates of Bessemer grade. This concentrated ore will need briqueting or agglomerating as it is finer than allowed for furnace use. It is possible to get a product carrying less than 1 % titanium, but a loss of iron in the tails will ensue so that a medium separation is preferable. This ore should be readily treated on a commercial scale using any of the separators adapted to handling ore in water.

Sample C came from near the Duck River on the North Shore of St. Lawrence River and contained quartz, magnetite, ilmenite, garnets, &c.

Separation as usual gave the following results:

Current used 0.8 amperes. Pole distance 2″.

	AVERAGE ORE	HEADS	TAILS
Weight	4 lbs	15 ounces	3 lbs 1 ounce
Metallic iron "available"	28.75%	64.62%	25.54%
Titanium dioxid	(not estimated)	1.99%	(not estimated)
Correspond'g to titanium		1.20%	

The results show that 1 ton of concentrated ore of Bessemer grade can be got from 4 tons of sand. This ore is in all respects similar to the first two.

Sample D came from the North Shore of the St. Lawrence River, east of the River St. John, and contained magnetite, quartz, a considerable amount of ilmenite, garnets, &c. The grains were about the same size all passing 0.10′ mesh. Separation as usual gave the following results :

	Average ore	Heads	Tails
Weight	5 lbs 14 ounces	3 lbs	2 lbs 14 ounces
Metallic iron "available"	43.76°/₀	64.96°/₀	32.01°/₀
Titanium dioxid	(non estimated)	4.92°/₀	(not estimated)
Correspond'g to titanium		2.95°/₀	

say a proportion of 50°/₀ of concentrated.

The results show that about 2 tons of crude ore will give one ton of concentrates fit for smelter use except that it must be briquetted or agglomerated. This sample is practically the same as the first 3 already treated. (*)

ASSAYS OF TITANIC IRON

Sample E came from the river Chaloupe on the North Shore of the St. Lawrence, and contained magnetite intermixed with ilmenite and pyroxene. The ore was crushed in a jaw crusher and passed through rollers, the products analysed to see which size carried the most titanium which is the only deleterious element present. The results are thus : (**)

Size	Weight	Titanium dioxid $Ti\,O^2$
Held on screen with 0.2" holes	2 oz.	16.22 °/₀
" " 0.10" "	2 lbs.	15.95 °/₀
Passing screen with 0.10" "	5 lbs. 6 oz.	18.48 °/₀

The results show about the same amount of titanium in each size. An experiment was made to see how fine it is necessary to crush such ore in order to free the magnetite from the ilmenite if this is possible.

(*) The results obtained by Mr Wells confirm what has been said in this report with reference to magnetic sands but the important question is what is the best method of concentration to employ J. O.

(**) To get the proportion of metallic titanium, multiply the proportion of titanium dioxid by 0.6029, practically by 0.6.

The ore (sample E) was crushed sized and passed through the magnetic separator with the following results :

SIZE	TITANIUM DIOXID IN ORE	TITANIUM DIOXID IN HEADS
Held on 0.10" screen …… .. …	15.95 %	13.62 %
Passing " " ………………	18.48 %	7.82 %

The results go to show that fine crushing is necessary in order to entirely free the ilmenite from mechanical combination with the magnetite. This is a disavantage as it entails expensive crushing and the product will need briquetting to some extent although ore passing a screen with holes of 0.10" diameter could no doubt be used to make up part of the furnace burden without previous briquetting.

Sample E crushed to pass a screen with holes of 0.10" diameter gave the following results on magnetic concentration.

	AVERAGE ORE	HEADS	TAILS.
Weight………………	5 lbs. 6 oz.	3 lbs. 3 oz.	2 lbs. 3 oz.
Metallic iron "available"	44.10%	58.58%	37.46%
Titanium dioxid………..	18.48%	7.82%	(not estimated).
Corresponding to titanium……………		4.69%	

By concentrating this ore 2 into 1. a high grade product can be obtained, but a loss of iron in the tails. No doubt a machine working into 3 parts—heads, middles, tails—would give better results.

Sample F was taken from the large deposit near Seven Islands, and contains magnetite intermixed with pyroxene and ilmenite.

The ore crushed, rolled and sized gave the following percentages for titanium which is the only objectionable constituent present :

	WEIGHT	TITANIUM DIOXID PER CENT
Held on 0 20" screen……….	1 lb ½	29.74%
do 0 10" do ……….	4 lbs	26.33%
do 0 10" do ……….	7 lbs	31.78%

The results show that the ilmenite crushes about the same as the magnetite.

The finest crushed was passsed through the magnetic separator with the following results :

	AVERAGE ORE.	HEADS.	TAILS.
Weight………………	7 lbs	4 lbs. 9 oz.	2 lbs. 7 oz
Metallic iron "available" . .	43.59%	51.69%	29.77%
Titanium dioxid………..	31.78%	15.16%	(not estimated)
Corresponding to titanium	………..	9.40%	

The concentrates are too high in titanium to be acceptable at the smelter. By concentrating 2 into 1, it is doubtful if a commercial grade can be secured, although by losing considerable iron in the tails, a high grade product can be confidently expected.

Sample G came from Kénogami in the Saguenay district, and contained magnetite along with ilmenite and siliceous matter.

The sample crushed, rolled and sized gave the following results :

	WEIGHT	TITANIUM DIOXID PER CENT
Held on 0.20" screen................	2 oz.	21.17%
Held on 0.10" screen................	12 oz.	17.97%
Passing 0.10"........................	1 lb. 10 oz.	23.32%

The results show that the ilmenite crushes the same as the magnetite.

The finest sized product passed through the magnetic separator gave the following results :

	AVERAGE ORE	HEADS	TAILS
Weight.....	1 lb. 10 oz.	1 lb.	10 oz.
Metallic iron "available".	42.74%	52.47%	25.88%
Titanium dioxid.........	23.32%	6.42%	not estimated
Corresponding to titanium..........		3.85%	

The results show a considerable elimination of titanium, but the iron contents have not been raised much owing no doubt to rock matter adhering to the ore. It seems probable that a good shipping ore can be got from this ore by magnetic concentration.

The results in all indicate that in some special cases it will pay to introduce magnetic concentration especially near water power and good shipping facilities.

These experiments in treating titanic iron made by Mr. Wells are very interesting and it would be very desirable to repeat them in a practical manner on larger quantities. J. O.

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ERRATA

Page 8, line 24—Instead of 103,952, read 1,039,520.
" 45, " 17—Instead of 0.86, read 0.08.